CLAIMS:

1. A method of synchronizing the carrier frequency of a mobile station with the carrier frequency of a base station in a cellular mobile communication system, a reference-frequency oscillator being re-adjusted by means of a final controlling element, characterized in that the frequency variation that occurs in the mobile station due to a change in the temperature of the mobile station and the frequency variation that occurs when there is a change in the location of the mobile station relative to the base station are determined and/or predicted separately, and in that, when a large frequency variation is determined and/or expected, the carrier frequency of the mobile station is synchronized with the carrier frequency of the base station, by means of an AFC algorithm, more frequently than is the case when a small frequency variation is determined and/or expected.

2. A method as claimed in claim 1, characterized in that a distinction is made in the mobile station between whether the frequency variation is due to a change in temperature and/or to a change in location and a distinction is made in particular between the proportion of the frequency variation that is due to a change in temperature and the proportion that is due to a change in location.

3. A method as claimed in claim 2, characterized in that the distinction is also made by determining whether the course followed by the frequency variation is steady or abrupt.

4. A method as claimed in any of the foregoing claims, characterized in that the frequency variations that result from a change in temperature and/or a change in location are processed together in such a way that canceling out by superimposition is detected.

5. A method as claimed in any of the foregoing claims, characterized in that a measured variable from which conclusions are drawn as to the absolute temperature of the mobile station is obtained in the mobile station.

6. A method as claimed in claim 5, characterized in that the time-based temperature gradient is determined from measured variables.

7. A method as claimed in claim 5 or 6, characterized in that a curve for the change in frequency as a function of temperature, which curve is characteristic of the mobile station, is stored in the mobile station as a table and a value corresponding to an expected change in frequency can be read out from this table.

8. A method as claimed in claim 7, characterized in that also stored in the values in the table is an exactness indicator that indicates how high the probability is of the value stored in the table matching the actual current shape of the characteristic curve.

9. A method as claimed in claim 7 or 8, characterized in that, when the mobile station is being manufactured, the table is preloaded by measuring certain plotting points on the characteristic curve, or by shifting a typical, known characteristic curve in translation by an additive value that has been obtained by measuring a single plotting point.

10. A method as claimed in claim 8, characterized in that, when the mobile station is being manufactured, the table is preloaded with the values for a typical, known characteristic curve without any measurements.

11. A method as claimed in any of claims 7 to 10, characterized in that the individual characteristic curve is determined or updated by teach-in processes during the operation of the mobile station.

12. A method as claimed in any of claims 8 to 11, characterized in that values that are preloaded at the time of manufacture have a lower exactness indicator and values measured when the standard of reception is good have a high exactness indicator and values having a low exactness indicator are replaced by values having a high exactness indicator.

13. A method as claimed in any of the foregoing claims, characterized in that a heating-up curve that is typical of the mobile station and that represents operation-related changes in temperature with time is stored in the mobile station as a table or as parameters of

the exponential function of the heating-up curve, from which an expected change in temperature can be estimated in advance.

14. A method as claimed in claim 13, characterized in that the change in frequency is estimated in advance by correlating the heating-up curve with the characteristic curve.

15. A method as claimed in any of the foregoing claims, characterized in that critical states that affect temperature are identified in advance, and the change in frequency to be expected can be estimated.

16. A method as claimed in any of the foregoing claims, characterized in that, before any measurement of the frequency error, an estimate is made of the temperature-related frequency error that can be expected.

17. A method as claimed in any of the foregoing claims, characterized in that, when measurements of the frequency variation are not possible due to poor reception conditions, the temperature-related frequency error that can be expected is estimated and is taken into account in the control process.

18. A method as claimed in any of the foregoing claims, characterized in that the current mode of operation of the mobile station, and particularly the current transmitted power and/or, in the case of a TDMA-based mobile station, the number of time slots occupied in the transmitting mode, are included in the processing for the estimation in advance of the change in temperature or frequency variation.

19. A method as claimed in any of the foregoing claims, characterized in that the probability of a imminent change in frequency which requires controlling action to be taken is determined in advance, for which purpose the following critical states of change of location are determined:

"movement within the infrastructure",
"imminent travel past below the base station",
"imminent change of cell".

20. A method as claimed in claim 19, characterized in that the information "movement within the infrastructure" is obtained in the idle mode from a change in the reception time of arrival (TOA) and/or from the received power on the reception frequency, with the change in the transmission timing advance (TA) being used in addition in the dedicated mode.

21. A method as claimed in claim 19 or 20, characterized in that the information "travel past below the base station" is obtained in the idle mode from the fact of the reception time of arrival (TOA) approaching a minimum and/or the fact of the received power on the reception frequency exceeding a given level, with the fact of the transmission timing advance (TA) approaching a minimum being used in addition in the dedicated mode.

22. A method as claimed in claim 19, 20 or 21, characterized in that the information "imminent change of cell" is obtained in the idle mode from the power measured in the adjacent cells, with the signaling to initiate the change of cell being used in addition in the dedicated mode.

23. A method as claimed in any of the foregoing claims, characterized in that the current reception conditions, and particularly the received field strength and/or the signal-to-noise ratio of the received signal, are measured and the control parameters, such as the length of the AFC control interval, the conversion by the AFC final controlling element and the exactness indicator for the table are derived from the results of the measurement.

24. A method as claimed in any of the foregoing claims, characterized in that the AFC algorithm adjusts the length of the AFC measuring intervals as a function of the size of the past and expected change in frequency, and/or when critical states of change of location and/or critical states that affect temperature are predicted.

25. A method as claimed in any of the foregoing claims, characterized in that the AFC algorithm adjusts the length of the AFC control interval as a function of the size of the past and expected change in frequency, and/or when critical states of change of location and/or critical states that affect temperature are predicted, and/or when the reception conditions are good.

26. A method as claimed in any of the foregoing claims, characterized in that the AFC algorithm adjusts the conversion by the AFC final controlling element as a function of the size of the past and expected change in frequency, and/or when critical states of change of location and/or critical states that affect temperature are predicted, and/or when the reception conditions are good.

27. A method as claimed in any of the foregoing claims, characterized in that the AFC algorithm adjusts the AFC's memory of measured values as a function of the size of the past and expected change in frequency, and/or when critical states of change of location and/or critical states that affect temperature are predicted, and/or when the reception conditions are good.

28. An arrangement for performing the method as claimed in any of the foregoing claims, characterized in that the reference-frequency oscillator (4) used is one that has no temperature-compensating circuitry and that has an individual characteristic curve having a maximum frequency variation from the nominal frequency of more than +/- 3 ppm in the operating temperature range.

29. An arrangement as claimed in claim 28 for performing the method, characterized in that a temperature sensor (5) is provided that measures the temperature of the reference-frequency oscillator (4).

30. A mobile station with a reference-frequency oscillator being re-adjusted by means of a final controlling element, characterized in that the frequency variation that occurs in the mobile station due to a change in the temperature of the mobile station and the frequency variation that occurs when there is a change in the location of the mobile station relative to the base station are determined and/or predicted separately, and in that, when a large frequency variation is determined and/or expected, the carrier frequency of the mobile station is synchronized with the carrier frequency of the base station, by means of an AFC algorithm, more frequently than is the case when a small frequency variation is determined and/or expected.

31. A microprocessor for a mobile station, the microprocessor is provided for controlling a reference-frequency oscillator characterized in that the microprocessor is provided for determining and/or predicting separately the frequency variation that occurs in the mobile station due to a change in the temperature of the mobile station and the frequency variation that occurs when there is a change in the location of the mobile station relative to the base station and in that, when a large frequency variation is determined and/or expected, the microprocessor is provided for synchronizing the carrier frequency of the mobile station with the carrier frequency of the base station, by means of an AFC algorithm, more frequently than is the case when a small frequency variation is determined and/or expected.